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14. ABSTRACT

Compressive Sensing (CS) has emerged as field of study that has the potential to revolutionize the sensor industry, with applications that span across commercial, defense, security and medical domains. While the mathematics is well understood, in recent years there has been a surge of interest in harnessing the potential of CS to design real-world systems that provide significant benefits in reducing hardware cost/complexity, improve the data processing efficiency, and enabling new sensing capabilities that cannot be achieved using conventional techniques. The purpose of the Incubator was to seek answers about what is "real" in CS. Hence, the questions on the table were:

15. SUBJECT TERMS

Compressive Sensing; Imaging Systems

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Report Title

Final Report: Support for Implications of Compressive Sensing Concepts to Imaging Systems

ABSTRACT

Compressive Sensing (CS) has emerged as field of study that has the potential to revolutionize the sensor industry, with applications that span across commercial, defense, security and medical domains. While the mathematics is well understood, in recent years there has been a surge of interest in harnessing the potential of CS to design real-world systems that provide significant benefits in reducing hardware cost/complexity, improve the data processing efficiency, and enabling new sensing capabilities that cannot be achieved using conventional techniques. The purpose of the Incubator was to seek answers about what is "real" in CS. Hence, the questions on the table were:

1. Are there any concrete applications where CS has offered a quantifiable advantage over other State of the Art techniques?
2. What are the underlying factors that lead to these advantages? Are these factors transferable to other important applications?
3. When there is a clear benefit, what are the challenges that are holding it back from implementation?
4. What technology advances are required to make it a compelling technique to help meet current and future needs?

Enter List of papers submitted or published that acknowledge ARO support from the start of the project to the date of this printing. List the papers, including journal references, in the following categories:

(a) Papers published in peer-reviewed journals (N/A for none)

Received Paper

TOTAL:

Number of Papers published in peer-reviewed journals:

(b) Papers published in non-peer-reviewed journals (N/A for none)

Received Paper

TOTAL:

Number of Papers published in non peer-reviewed journals:

(c) Presentations

Number of Presentations: 0.00

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):

(d) Manuscripts

Received Paper

TOTAL:

Number of Manuscripts:

Books

Received Book

TOTAL:

Received Book Chapter

TOTAL:

Patents Submitted

Patents Awarded

Awards

Graduate Students

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Names of Post Doctorates

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Names of Faculty Supported

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Names of Under Graduate students supported

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period: 0.00

The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:..... 0.00

Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):..... 0.00

Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:..... 0.00

The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense 0.00

The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields: 0.00

Names of Personnel receiving masters degrees

NAME

Total Number:

Names of personnel receiving PHDs

NAME

Total Number:

Names of other research staff

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

Technology Transfer

OSA Incubator
Implications of Compressive Sensing Concepts to Imaging Systems

9-11 April 2014
OSA Headquarters ● 2010 Massachusetts Ave. NW ● Washington, DC, USA

HOSTED BY:
Ravi Athale, *Office of Naval Research;* **Abhijit Mahalanobis,** *Lockheed Martin*
Joe Mait, *Army Research Laboratory;* **Mark Neifeld,** *University of Arizona*

AGENDA

Wednesday, 9 April 2014

18:00 **Welcome Dinner**
Ezme, 2016 P Street, NW

Thursday, 10 April 2014

7:45 **Breakfast**
OSA Headquarters, 2010 Massachusetts, Ave., NW

8:15 **Welcome**
Elizabeth Rogan, Chief Executive Officer, OSA
Abhijit Mahalanobis, Lockheed Martin

8:30 **Goals of the Incubator**
Mark Neifeld, University of Arizona

9:00 **Mathematical Framework**
Larry Carin, Duke University

9:30 **Medical Imaging Panel**
Emil Sidky, University of Chicago
Christian Graff, Center for Devices and Radiological Health, USFDA

10:50 **Coffee Break**

11:10 **RF Sensing Panel**
Lee Potter, Ohio State University
Nathan Goodman, University of Oklahoma

Thursday, 10 April 2014 (continued)

12:30 **Lunch with Guest Speakers**
Jonathan Nichols, Naval Research Laboratory
David Brady, Duke University

13:45 **EO Imaging Panel**
Mike Gehm, Duke University
James Fienup, University of Rochester

15:15 **Break-out Group Goals**

15:30 **Break-out Group Discussions**

1. Commercial Security Cameras for use in Homes, Businesses, Stadiums or Airports
   Leader: Mike Gehm, Duke University
2. UAV Surveillance Imaging
   Leader: Randy Gann, Raytheon Company
3. Near IR Imaging for Intra-cranial Bleeding Detection and Localization
   Leader: Emil Sidky, University of Chicago
4. Soldier-scale Situational Awareness
   Leader: Richard Lepkowicz, Rose-Hulman Institute of Technology
5. Astronomical Imaging Applications
   Leader: Jim Fienup, University of Rochester

18:30 **Dinner**
Al Tiramisu, 2014 P St NW, Washington, DC 20036

Friday, 11 April 2014

8:30 **Breakfast**
OSA Headquarters, 2010 Massachusetts, Ave., NW

9:00 **Break-out Group Discussions (continued)**

10:00 **Coffee Break**

10:30 **Break-out Group Presentations**

12:00 **Working Lunch**
Group Discussion to Outline Report

13:15 **Wrap-up and Next Steps**

13:30 **Adjourn**

OSA Incubator Implications of Compressive Sensing Concepts to Imaging Systems

BREAKOUT GROUPS

1. **Commercial Security Cameras for use in Homes, Businesses, Stadiums or Airports**
   Leader: Mike Gehm, Duke University
   This is one example where generating a "pretty picture" is not only not needed, but is not ALLOWED due to privacy concerns. Remember the huge controversy caused by mmW imagers seeing people "naked"? These applications also require covering very wide areas for long durations. Because the objective is detecting anomalous events this challenge problem should pursue a non-imaging compressive camera that triggers a high resolution conventional camera for further analysis or forensics. Performance improvements and/or cost reductions may be possible via CS (i.e., and you may wish to pursue these). Imaging modalities may include passive mmW wave, night vision, and multispectral extensions.

2. **UAV Surveillance Imaging**
   Leader: Randy Gann, Raytheon
   Imagers for this application strive to achieve large fields of view (i.e., approaching 2pi sr) while maintaining diffraction-limited resolution (e.g., < 1m ground sample distance) and high frame rates (> 10 Hz). Current solutions achieve these goals by deploying ever more complex/costly optical systems, focal planes, and on-board computing. This challenge problem therefore will focus on employing CS to reduce platform costs (e.g., size, weight, power, communication bandwidth, etc.) compared with these more conventional approaches. Note that some of these deployed systems may be operated in a detection and tracking mode and therefore will not always require the reconstruction of a conventional image.

3. **Near IR Imaging for Intra-cranial Bleeding Detection and Localization**
   Leader: Emil Sidky, University of Chicago
   Near IR radiation has been used in diffuse optical tomography and for blood oxygenation level measurement. There are commercial systems for detecting intracranial bleeding. Can one use compressive techniques to get a crude level of localization which can help in diagnosing? A generalization of the problem involves deep tissue imaging with non-ionizing radiation.

4. **Soldier-scale Situational Awareness**
   Leader: Richard Lepkowicz, Booz Allen Hamilton
   Light weight and low power are both critical attributes for soldier-borne equipment. Are there opportunities for CS to provide non-imaging situational awareness in the form of muzzle flash detection, 360 threat detection, mapping and navigation, automated foveation and zoom, etc. ? How the CS-inspired would approaches compare (i.e., in performance and mass) to their more conventional counterparts? Are there analogous opportunities in the commercial space for such situational awareness (e.g., environmentally aware google glass). Note that user motion presents a challenge for non-imaging sensors and mitigating this ego-motion challenge may be another interesting aspect of this challenge.

5. **Astronomical Imaging Applications**
   Leader: Jim Fienup, University of Rochester
   The need for improved light collection and resolution continue to motivate ever larger apertures for astronomical imaging applications and drive the cost of such systems. Large arrays of highly sensitive low noise detectors represent another cost driver. Are there new opportunities for CS to impact any of these costs without sacrificing the exquisite performance that is currently achieved? For example, could CS enable the use of sparser sparse apertures or could CS facilitate the use of fewer higher quality detectors (e.g., single photon counting and/or photon number resolving)?

Implications of Compressive Sensing Concepts to Imaging Systems Incubator Meeting			
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OSA Incubator Implications of Compressive Sensing Concepts to Imaging Systems

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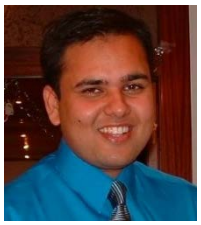


Amit Ashok is an Assistant Professor in the College of Optical Sciences and the Department of Electrical and Computer Engineering at the University of Arizona. He directs the Intelligent Imaging and Sensing Lab with focus in the areas of computational imaging, statistical inference, and intelligent system design. Before joining Optical Sciences, he was research faculty in the Department of Electrical and Computer Engineering at the University of Arizona from 2009 to 2011 and served as a senior research scientist in the research and development division of Omnivision CDM Optics from 2007 to 2009. He received his Ph.D. in Electrical and Computer Engineering from the University of Arizona in 2008 and his M.S. in Electrical Engineering from the University of Cape Town, South Africa in 2001. His research interests include computational imaging and sensing, physical optics, statistical inference, machine learning, and information theory. He has over 40 peer-review journal and conference publications and he is an active member of the IEEE, SPIE and OSA professional societies. He is currently a General Chair of OSA's Computational Optical Sensing and Imaging (COSI) topical meeting.

Ravindra Anant Athale, HOST

Dr. Athale received his B.S. (1972) from the University of Bombay and M.S. (1974) from the Indian Institute of Technology, Kanpur, both in physics. He received his Ph.D. (1980) in Electrical Engineering from the University of California, San Diego. From 1981 to 1985 he worked as a Research Physicist in the Optical Signal Processing section of Naval Research Laboratory. From 1985 to 1990 he was a Senior Principal Staff Member at BDM Corporation in McLean, VA, where he headed a group in Optical Computing and supported DARPA program in Strategic Computing. From 1990 to 2001 he was a faculty member in the Electrical and Computer Engineering Department at George Mason University, in Fairfax, VA. From 2001-2005 he was on assignment to Defense Advanced Research Projects Agency as a Program Manager in Photonics. At DARPA, he initiated programs in Chip-to-chip optical interconnects, computational imaging systems and university centers in nanophotonics. From 2005 to 2012 he was Principal Scientist in the Emerging Technology Office at MITRE Corp. where he managed an IR&D portfolio in Emerging Technologies and led a group in computational imaging. He is currently a Program Officer at Office of Naval Research managing research in imaging sensors, optical computing and nanophotonics. Dr. Athale was elected Fellow of the Optical Society in 1989. He has published over 50 journal papers including two invited papers in Proceedings of IEEE and holds several patents in the area of optical processing. Dr. Athale received the Optical Society's Leadership Award - New Focus/Bookham Prize for 2005 and was awarded Secretary of Defense Medal for Exceptional Public Service.

David Brady

David Brady is a professor of photonics and electrical and computer engineering at Duke University, where he leads the Duke Imaging and Spectroscopy Program.

Larry Carin

Lawrence Carin earned the BS, MS, and Ph.D. degrees in electrical engineering at the University of Maryland, College Park, in 1985, 1986, and 1989, respectively. In 1989 he joined the Electrical Engineering Department at Polytechnic University (Brooklyn) as an Assistant Professor, and became an Associate Professor there in 1994. In September 1995 he joined the Electrical Engineering Department at Duke University, where he is now the William H. Younger Distinguished Professor. Dr Carin's early research was in the area of electromagentics and sensing, and over the last ten years his research has moved to applied statistics and machine learning. He has recently served on the Program Committee for the following machine learning conferences: International Conf. on Machine Learning (ICML), Neural and Information Processing Systems (NIPS), Artificial Intelligence and Statistics (AISTATS), and Uncertainty in Artificial Intelligence (UAI). He was previously an Associate Editor of the IEEE Trans. on Antennas and Propagation, and he is currently an Associate Editor for the IEEE Trans. on Signal Processing and the SIAM J. of Imaging Science. He is an IEEE Fellow.

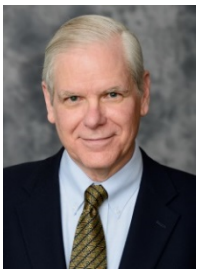
Alex Dapore

Alex Dapore received a BSEE in 2008 and a MSEE in 2010 from the University of Illinois at Urbana-Champaign. He is currently employed at L-3 Communications Cincinnati Electronics as an image processing engineer in the research and development group for infrared products. His current research interests include super resolution, image registration, image restoration, and object detection/tracking.

Todd Du Bosq

Dr. Du Bosq is currently a physicist in the modeling and simulation division at the U.S. Army's Night Vision and Electronic Sensors Directorate. He received a B.S. degree in physics from Stetson University in 2001. He received his M.S. and Ph.D. degrees in physics from the University of Central Florida in 2003 and 2007, respectively. His research interests include target acquisition and system engineering modeling for EO/IR imaging systems.

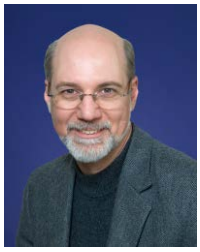
James Fienup



James R. Fienup received an A.B. in physics and mathematics from Holy Cross College (Worcester, MA), and M.S. and Ph.D. degrees in Applied Physics from Stanford University, where he was a National Science Foundation Graduate Fellow. He performed research at the Environmental Research Institute of Michigan and Veridian Systems, where he was a Senior Scientist. He joined the faculty at the University of Rochester in 2002 as the Robert E. Hopkins Professor of Optics. Professor Fienup is a member of the National Academy of Engineering, and is a Fellow of the Optical Society of America and of the International Society for Optical Engineering (SPIE). He was awarded the Rudolf Kingslake Medal and Prize for 1979 by the SPIE and the International Prize in Optics for 1983 by the International Commission for Optics and the Emmett Leith Medal by the OSA in 2013. He was a Distinguished Visiting Scientist at the Jet Propulsion Laboratory in 2009. He was Editor-in-Chief of the Journal of the Optical Society of America A, 1997-2003. He previously served as Division Editor of Applied Optics - Information Processing, and Associate Editor of Optics Letters, and as the Chair of the OSA's Publications Council.

Professor Fienup's research interests center around imaging science. His work includes unconventional imaging, phase retrieval, wavefront sensing, and image reconstruction and restoration. These techniques are applied to passive and active optical imaging systems, synthetic-aperture radar, and biomedical imaging modalities. His past work has also included diffractive optics and image quality assessment. He has over 220 publications and 5 patents.

Randy Gann



Mr. Randy Gann is a Technology Area Director within Raytheon's Space and Airborne Systems business. He has supported the development activities for a wide variety of EO/IR/Ladar imaging technologies for use in military effects and surveillance systems. Most recently, Randy has been active in the exploration of computational imaging / compressive sensing techniques to improve the capabilities of imaging systems.

Michael Gehm

Michael Gehm joined the faculty at Duke University in fall 2013, and is currently an Associate Professor in the Department of Electrical and Computer Engineering. At Duke he directs LENS---the Laboratory for Engineering Non-traditional Sensors. His research interests in computational sensing span multiple modalities ranging from VIS/IR spectral imaging to mass spectrometry, with a particular emphasis on adaptive methods.

He completed his Ph.D. in Physics at Duke University, in 2003, for experimental studies of quantum degenerate atomic gases. From 2004-2006 he was a postdoctoral researcher in the Electrical and Computer Engineering department at Duke, where he first began his studies of computational sensing. From 2007-2013 he was an Assistant Professor at the University of Arizona, with appointments in the Department of Electrical and Computer Engineering and the College of Optical Sciences.

Nathan Goodman

Nathan A. Goodman received the B.S., M.S., and Ph.D. degrees in electrical engineering from the University of Kansas in 1995, 1997, and 2002, respectively. He is currently an Associate Professor with the School of Electrical and Computer Engineering at the University of Oklahoma. Dr. Goodman's research interests are in radar and array signal processing.

From 1996 to 1998, Dr. Goodman was an RF Systems Engineer for Texas Instruments, Dallas, TX, and from 1998 to 2002, he was a Graduate Research Assistant in the Radar Systems and Remote Sensing Laboratory at the University of Kansas. From 2002 – 2011, Dr. Goodman was a professor in the ECE Department at the University of Arizona.

Dr. Goodman is a senior member of the IEEE. He has served as a reviewer for numerous journals and conferences, and currently serves as an Associate Editor for IEEE Transactions on Aerospace & Electronic Systems. Dr. Goodman was a technical co-chair for the 2011 IEEE Radar Conference and is currently Finance Chair for the 2012 Sensor Array and Multichannel Signal Processing Workshop. He was awarded the Madison A. and Lila Self Graduate Fellowship upon returning to the University of Kansas for Ph.D. studies in 1998

Vivek Goyal

Vivek K Goyal was born in Waterloo, Iowa. He received the B.S. degree in mathematics and the B.S.E. degree in electrical engineering from the University of Iowa, where he received the John Briggs Memorial Award for the top undergraduate across all colleges. He received the M.S. and Ph.D. degrees in electrical engineering from the University of California, Berkeley, where he received the Eliahu Jury Award for outstanding achievement in systems, communications, control, or signal processing.

He was a Member of Technical Staff in the Mathematics of Communications Research Department of Bell Laboratories, Lucent Technologies, 1998-2001; and a Senior Research Engineer for Digital Fountain, Inc., 2001-2003. He joined the Massachusetts Institute of Technology in 2004, where he held the Esther and Harold E. Edgerton Chair and is currently a member of the Research Laboratory of Electronics. He is currently an Assistant Professor of Electrical and Computer Engineering with Boston University. His research interests include computational imaging, sampling, quantization, and source coding theory.

Dr. Goyal is a member of Phi Beta Kappa, Tau Beta Pi, Sigma Xi, Eta Kappa Nu, SIAM, and EURASIP. He is a Fellow of the IEEE. He was awarded the 2002 IEEE Signal Processing Society Magazine Award and an NSF CAREER Award, and his students have been awarded several thesis and conference best paper awards. He served a six-year term on the IEEE Signal Processing Society's Image and Multiple Dimensional Signal Processing Technical Committee and was a plenary speaker at IEEE Data Compression Conference 2009, IEEE Multimedia Signal Processing Workshop 2009, and EUSIPCO 2012. He is a Technical Program Committee Co-chair of IEEE ICIP 2016, a member of the Scientific Advisory Board of the Banff International Research Station for Mathematical Innovation and Discovery, and a permanent Conference Co-chair of the SPIE Wavelets and Sparsity conference series.

Christian Graff, Center for Devices and Radiological Health, USFDA
(Photo and biography unavailable.)

Keith Krapels, U.S. Army Night Vision and Electronic Sensors Directorate
(Photo and biography unavailable.)

Richard Lau

Dr. Richard C. Lau is a Chief Scientist and ACS Fellow of Applied Communication Sciences (formerly Telcordia). He has over 25 years of experience in wireless and broadband technologies, digital signal processing and optimization, and program management. He received his Ph.D. EE from the University of Pennsylvania, Moore School, Philadelphia, PA., in 1987. His research and contribution span multiple disciplines in mathematical modeling and signal processing algorithms applied to multi-sensor networks, imaging, and Electronic Warfare. His recent research includes compressive sensing for 3D signal processing, optimization techniques for UAV flight path prediction, and dynamic power control and optimization for 3G/4G wireless networks. In the last few years, he has worked on techniques and algorithms for GPS-denied navigation. In addition, he has also worked on optimization in smart grid demand response using game theoretical approach.

Richard Lepkowicz

Rich Lepkowicz works for Booz Allen Hamilton and provides technical program development and management for a number of government agencies, and is currently assisting in programs related to advances in vivo measurement (imaging and non-imaging) techniques for neural recording and control. He has over 12 years of research experience in optical sciences/engineering in academia and government laboratories with proven expertise in the areas of optical design (proficient in Zemax and Code V) incorporating advanced materials/components for traditional and non-traditional (task/feature-specific, compressive) systems; image chain analysis; optical fabrication, assembly, and characterization methods; nonlinear optical materials and experimental methods; numerical and analytical beam propagation methods.

Abhijit Mahalanobis, HOST

Dr. Abhijit Mahalanobis is a Senior Fellow of the Lockheed Martin Corporation. His primary research areas are in Optical information processing, Computational Sensing and Imaging, and Video/Image processing for information exploitation and ATR. He has over 140 journal and conference publications in this area. He also holds three patents, co-authored a book on pattern recognition, contributed several book chapters, and edited special issues of several journals. Abhijit completed his B.S. degree with Honors at the University of California, Santa Barbara in 1984. He then joined the Carnegie Mellon University and received the MS. and Ph.D. degrees in 1985 and 1987, respectively. Prior to joining Lockheed Martin, Abhijit worked at Raytheon in Tucson, and was a faculty at the University of Arizona and the University of Maryland.

Abhijit was elected a Fellow of SPIE in 1997, and a Fellow of OSA 2004 for his work on optical pattern recognition and automatic target recognition. He served as an associate

editor for Applied Optics from 2004-2009. He is a current member of the OSA Board of Meetings, and served on OSA's Science and Engineering council in the capacity of Pattern Recognition Chair from 2001-2004. Abhijit was recognized as the Innovator of the Year by the State of Arizona in 1999, and was elected to the Raytheon Honors program for distinguished technical contribution and leadership. At Lockheed Martin, he has received numerous recognitions including the Author of the Year award (2001), the Inventor of the Year (2005), and the prestigious Lockheed Martin NOVA award (2005), the Corporation's highest honor. In 2006, Abhijit was recognized as the Scientist of the Year by Science Spectrum Magazine, a publication of the career communication group.

Joseph Mait, HOST

Dr. Mait has been with the U.S. Army Research Laboratory (formerly Harry Diamond Laboratories) since 1988, where he has served in several positions. Since November 2013 he is ARL's Chief Scientist of ARL. In 2005, he was selected as a senior technical researcher (ST). Dr. Mait's research interests include sensors and the application of optics, photonics, and electro-magnetics to sensing and sensor signal processing. Particular research areas include diffractive optic design and computational imaging. He also had an unexpected sojourn into autonomous systems, where for six years he led ARL's program on micro-autonomous systems and technology.

Early in his career Dr. Mait was an assistant professor of Electrical Engineering at the University of Virginia. He was also an adjunct associate professor at the University of Maryland, College Park, and adjunct professor at Duke University. He has held visiting positions at the Lehrstuhl für Angewandte Optik, Universität Erlangen-Nürnberg, Germany and the Center for Technology and National Security Policy at the National Defense University in Washington DC. He is currently Editor-in-Chief of Applied Optics. He is a Fellow of SPIE and OSA, and a senior member of IEEE. He is also a member of Sigma Xi, Tau Beta Pi, and Eta Kappa Nu, and is a Raven from the University of Virginia. Dr. Mait received his BSEE from the University of Virginia in 1979 and received his graduate degrees from the Georgia Institute of Technology; his MSEE in 1980 and Ph.D. in 1985.

Predrag Milojkovic

Predrag Milojkovic received his Dipl.Ing. degree in Electrical Engineering from University of Belgrade, Yugoslavia, in 1978, and Ph.D. in Electrical and Computer Engineering from George Mason University in 2001. From 1998 to 2003 he worked for Applied Photonics on a couple of DARPA-funded free space optical interconnect programs. Dr. Milojkovic worked at Northrop Grumman 2003-2010 on designing and developing new electro-optical and infrared imaging concepts and systems. He joined Army Research Laboratory in 2010. His research at ARL is focused on optical super-resolution with active illumination, computational imaging, gradient index optics, and analysis and modeling of high resolution, wide field of view imagers. Dr. Milojkovic has published over 30 publications in peer reviewed journals and conferences, and holds one patent.

Robert Muise

Dr. Robert Muise is a Senior Staff Engineer at Lockheed Martin Missiles and Fire Control. He has two patents: Target Detection System Using Trained and Untrained Detection and Methods Thereof, R. Muise and A. Mahalanobis, United States Patent No. 7,421,090 and System and method for passive automatic target recognition (ATR), S.R. Stanfill; B. Rutherford; H. Beydoun; R. Muise; A. Mahalanobis; R. Bhagavatula; United States Patent No. 8,369,572. Dr. Muise has managed a large academic team (DARPA's KECoM and ISP programs), led an IPT for DARPA's Lacoste program, and manages significant Lockheed Martin IRAD efforts in information processing and exploitation. He is a member of SIAM, senior member of IEEE, and an organizer-participant in workshops/symposiums for computational/compressive sensing.

Mark Allen Neifeld, HOST

Mark Neifeld is a Professor in the College of Optics and the Department of Electrical and Computer Engineering at the University of Arizona. He was recently also a program manager at DARPA/DSO where he started programs on quantum information, compressive sensing and computational imaging. He has coauthored more than 120 journal articles and 250 conference papers in the general areas of optical physics and engineering. Professor Neifeld is a Fellow of both the OSA and the SPIE and a member of the IEEE and APS. He has served on the organizing committees of numerous conferences and symposia. He has been a two-term topical editor for Applied Optics and a three-time Guest Editor of special issues of Applied Optics. His current research interests include computational sensing, multi-mode optical communications, optical orbital angular momentum, 3D optics and multi-domain optimization.

Jonathan Nichols

Jonathan Nichols received the B.Sc. degree from the University of Delaware in 1997 and the M. Sc. and Ph.D. degrees from Duke University in 1999 and 2002 respectively, all in Mechanical Engineering. He currently works for the Naval Research Laboratory in Washington, D.C. as a member of the Maritime Sensing Section in the Optical Sciences Division. His research interests include the modeling and analysis of infrared imaging devices, signal and image processing, and parameter estimation. Jonathan's current work focuses on solving highly underdetermined linear systems of equations and the application of those solutions to various problems in imaging.

Darcy Peterka

Dr. Peterka is a research scientist at Columbia University. He has a B.S. in Mathematics from Cornell University, and a Ph.D. in Chemistry from the University of California at Berkeley. For 20 years Darcy has been using imaging in scientific experiments, first to elucidate complex dynamics in photoinitiated reactions, then to study energy transfer in quantum fluids, and now, towards understanding the brain. While in California, Darcy spent ten years working with the Chemical Dynamics Group at Lawrence Berkeley National Laboratory, where he gained expertise in optics, imaging, and advanced detectors. For the past six years, Darcy has been working closely with Prof. Rafael Yuste at Columbia, with a focus on applying advanced optical methods to observe and manipulate the activity of neuronal ensembles.

Rafael Piestun

Rafael Piestun received MSc. (1994) and Ph.D. (1998) degrees in Electrical Engineering from the Technion – Israel Institute of Technology. From 1998 to 2000 he was a researcher at Stanford University. Since 2001 he has been with the Department of Electrical and Computer Engineering and the Department of Physics at the University of Colorado – Boulder. Professor Piestun is a fellow of the Optical Society of America, was a Fulbright scholar, an Eshkol fellow, received a Honda Initiation Grant award, a Minerva award, a Provost Achievement Award, and El-Op and Gutwirth prizes. He served in the editorial committee of Optics and Photonics News and was associate editor for Applied Optics. He is the Director and Principal Investigator of the NSF-IGERT program in Computational Optical Sensing and Imaging at the University of Colorado. His areas of interest include computational optical imaging, superresolution microscopy, volumetric nano-photonic devices, and ultrafast optics.

Andrew Pipino

Andrew received his Ph.D. in Chemical Physics, Northwestern University 1995. While nonlinear plasmonics was the focus of his thesis research, his primary post-graduate research area for 18 years has been laser-based techniques for chemical detection, including cavity ring-down spectroscopy and Raman spectroscopy, including gated stand-off Raman for IED detection. For the last two years, Andrew has been at Office of Naval Research managing R&D programs for the Navy, and participating in quantum imaging research at Navy Research Laboratory.

Lee Potter

Lee C. Potter received the B.E. degree from Vanderbilt University, Nashville, TN, and the M.S. and Ph.D. degrees from the University of Illinois at Urbana-Champaign, all in electrical engineering. Since 1991, he has been with the Department of Electrical Engineering, The Ohio State University (OSU), Columbus, where he is currently Professor and investigator at the Davis Heart and Lung Institute. His research interests include statistical signal processing, inverse problems, detection, and estimation, with applications in radar and medical imaging. Dr. Potter is a recipient of the OSU College of Engineering MacQuigg Award for Outstanding Teaching and Lumley Research Award.

Justin Romberg

Dr. Justin Romberg is an Associate Professor in the School of Electrical and Computer Engineering at the Georgia Institute of Technology. Dr. Romberg received the B.S.E.E. (1997), M.S. (1999) and Ph.D. (2004) degrees from Rice University in Houston, Texas. From fall 2003 until fall 2006, he was a Postdoctoral Scholar in Applied and Computational Mathematics at the California Institute of Technology. He spent the summer of 2000 as a researcher at Xerox PARC, the fall of 2003 as a visitor at the Laboratoire Jacques-Louis Lions in Paris, and the fall of 2004 as a Fellow at UCLA's Institute for Pure and Applied Mathematics. In the fall of 2006, he joined the Georgia Tech ECE faculty. In 2008 he received an ONR Young Investigator Award, in 2009 he received a PECASE award and a Packard Fellowship, and in 2010 he was named a Rice University Outstanding Young Engineering Alumnus. In 2006-2007 he was a consultant for the TV show 'Numb3rs' and from 2008-2011, he was an Associate Editor for the IEEE Transactions on Information Theory. He is currently on the editorial board for the SIAM Journal on Imaging Science.

Emil Sidky

Emil Sidky received his B.S. degrees in physics, astronomy-physics, and mathematics from the University of Wisconsin - Madison in 1987 and his Ph.D. in physics from The University of Chicago in 1993. He held academic positions in theoretical atomic physics at the University of Copenhagen, University of Bielefeld and Kansas State University. He joined the Department of Radiology at The University of Chicago in 2001, where he is currently a Research Associate Professor. His current interests are in CT image reconstruction, large-scale optimization, and objective assessment of image quality.

Michael Stenner

Michael has broad interests in optical imaging, sensing, and communications, and is published in such diverse areas as quantum optics, slow/fast light, holography, and computational imaging. Michael received his Ph.D. in physics from Duke University, served as a postdoc at the University of Arizona, and is now at the MITRE Corporation. At MITRE, Michael both conducts internal research and development on novel sensing technology and supports a number of government programs on sensing, imaging, and computer vision.

Lei Tian

Lei Tian is a postdoc associate in Computational Imaging Lab led by Dr. Waller at University of California, Berkeley, where his research focus is on compressive sensing method for phase space imaging and computational illumination for microscopy. He received his B.S degree (2008) in department of Mechanical Engineering from Tsinghua University. He received his M.S. (2010) and Ph.D.(2013) degree in department of Mechanical Engineering from Massachusetts Institute of Technology, where he conducted his research in 3D Optical System Group led by Dr. Barbastathis on compressive sensing applied to digital holographic imaging of two phase flows, X-ray phase imaging and coherence state recovery.

Miaochan Zhi

Miaochan Zhi received the B.E. degree in optical engineering, in 1996, and M.S. degree in optical physics, in 2001, from Zhejiang University, China. In 2001, she joined Alexei Sokolov's Subfemtosecond Science Lab in Dept. of Physics, Texas A&M University, where she received a Ph.D. degree in ultrafast optics, in December 2007.

The year after receiving the Ph.D. degree, Miaochan worked for a private company to develop a noninvasive glucose biosensor by using femtosecond laser coherent anti-Stokes spectroscopy for 8 months. After that she worked as a postdoctoral research associate with Prof. Alexei Sokolov on single-cycle pulse generation in Raman-active crystals. In the last two years, she also worked with 50% effort in the department of Biomedical engineering at Texas A&M University, investigating adaptive optics application in nonlinear microscopic imaging and other advanced nonlinear optical techniques.

Miaochan Zhi joined NIST at Maryland recently as a research physicist. Her research focuses on the study of glass dynamics and application to stability of proteins in saccharide glasses using femtosecond laser spectroscopy.